Space Weather Technical Forecast

Issued on Thursday 6 March 2025 at 00:31 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: M-class flares likely (R1-R2; Minor-Moderate radio blackouts) throughout. G1/G2 likely Days 3/4.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate, with a peak flare of M1.7 at 05/1150UTC from AR4016 located in the southeast quadrant. Nine sunspot regions cover the visible solar disc. AR4012 in the southeast is the largest region but hasn't produced any significant flares recently. AR4007, the second largest region , is a relatively simple bi-polar group. AR4009 lies just south of AR4014, both regions are declining and now unipolar. AR4011 faded to plage, though a NEW region has appeared just to the north of it. AR4016 in the southeast has shown recent growth and has a complex magnetic structure despite its small size. AR4017 and 4018 have recently been numbered.

No Earth-directed Coronal Mass Ejections (CMEs) were identified in available coronagraph imagery.

Solar Wind / Geomagnetic Activity: Solar winds, as measured by ACE at L1, are Slightly Elevated. The solar winds are gradually declining with speeds currently around 430km/s. Solar wind density was mainly Average or below Average. The Interplanetary Magnetic Field was at mostly Weak and the north-south component was rather variable and Weak. The 24 hour period range was from +7/-7nT. The phi angle was largely positive (away from the Sun), with brief incursions to negative (towards the Sun).

The net result of the above solar wind measures was Quiet to Unsettled (Kp1-3) geomagnetic activity.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 was at Background.

High energy electron flux saw a rise in its diurnal oscillation, reaching Moderate levels of 631pfu at 05/1635UTC. The 24-hour fluence was below the Active threshold (1e8 integrated pfu), on a declining trend, recording 1.32e7 integrated pfu at 05/2359UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate levels expected, with M-class flares likely.

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Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the forecast. Slightly Elevated winds are expected to continue declining towards Background at first. During Day 3 (8 March) Earth is likely to connect with the High Speed Stream from CH21/-. Solar wind speeds are expected to increase to Elevated to Strong. Geomagnetic activity is expected to be Quiet to Unsettled (Kp1-3) on Days 1 and 2 (6/7 March). However, on day 3 (8 March) and during Day 4 (9 March) periods of Active to G1/minor geomagnetic storm (Kp3-5) are likely with a chance of isolated G2/Moderate geomagnetic storms (Kp6).

Energetic Particles / Solar Radiation: High energy proton flux should remain at Background levels. High energy electron flux is likely to remain background to Moderate. The associated 24 hour fluence is expected to remain below the Active threshold.

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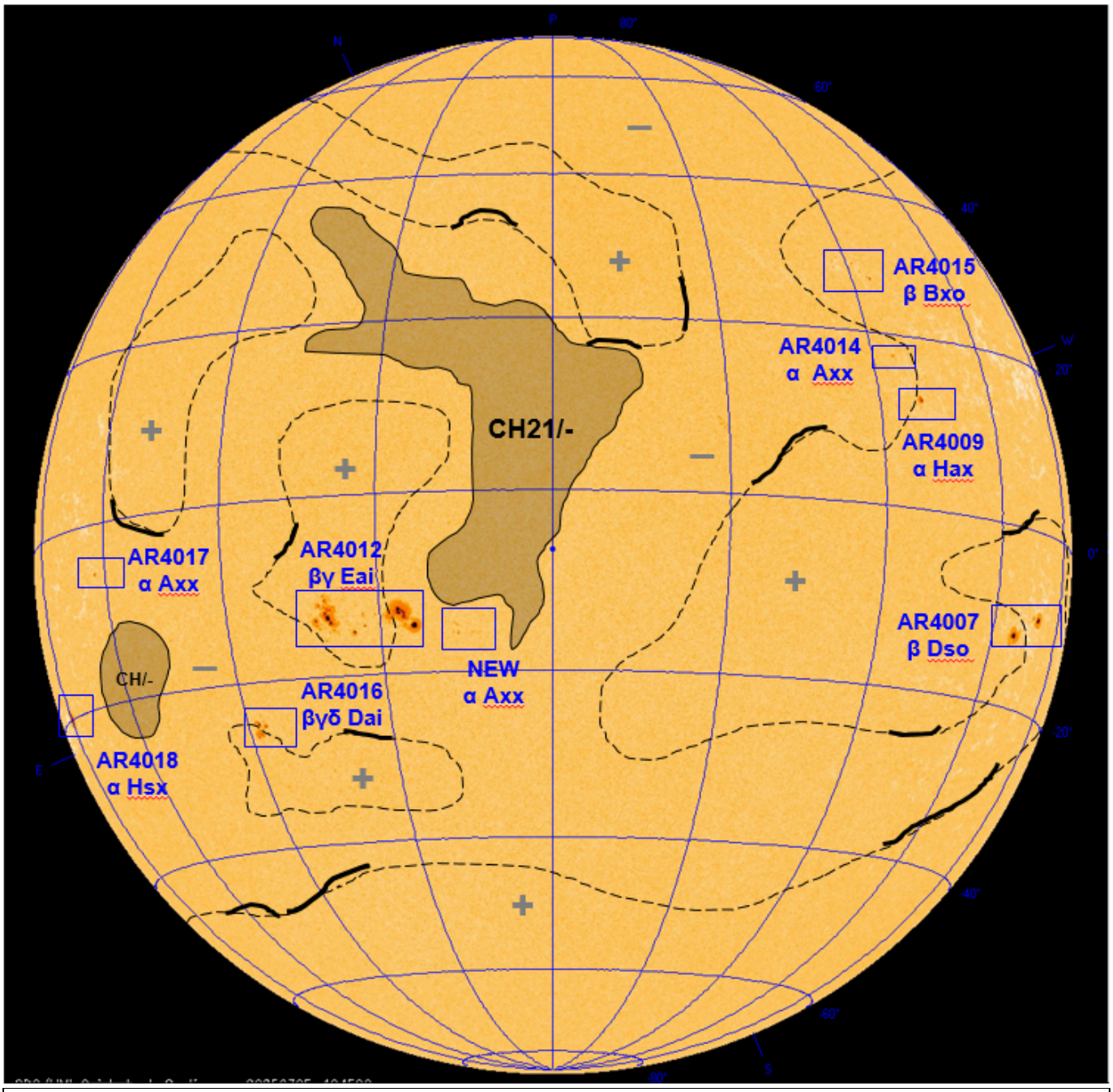
Figure 1: Solar Synoptic Analysis 05/2000UTC



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms

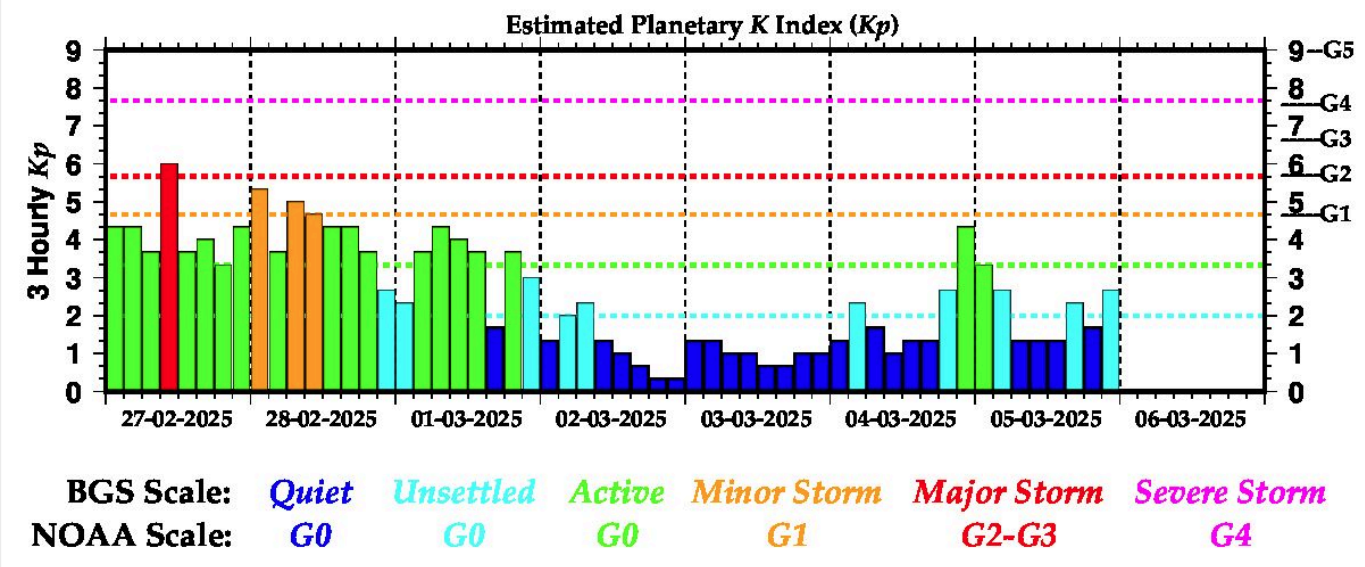
There are no Earth-directed CMEs.

Slightly Elevated winds should decline towards Background over coming Days 1 and 2 (6/7 March). On Day 3 (8 March) Earth is expected to connect with the High Speed Stream from coronal hole 21/-. Elevated to Strong wind speeds are expected, this is supported by 27 day persistence and MOSWOC Enlil.

Geomagnetic activity is expected to be Quiet to Unsettled (Kp1-3) on Days 1 and 2. However, on Day 3 (8 March), geomagnetic activity is expected to increase due to the CH HSS. Given that we are approaching the vernal equinox and observation of G1 minor storm on the previous rotation, periods of Active to G1/minor geomagnetic storm (Kp3-5) are likely with a chance of isolated G2/Moderate geomagnetic storm (Kp6) later on day 3 or during Day 4 (8/9 March).

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	1	1	60	60
Strong	G3	No	1	1	10	10
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: BGS Estimated Planetary K Index



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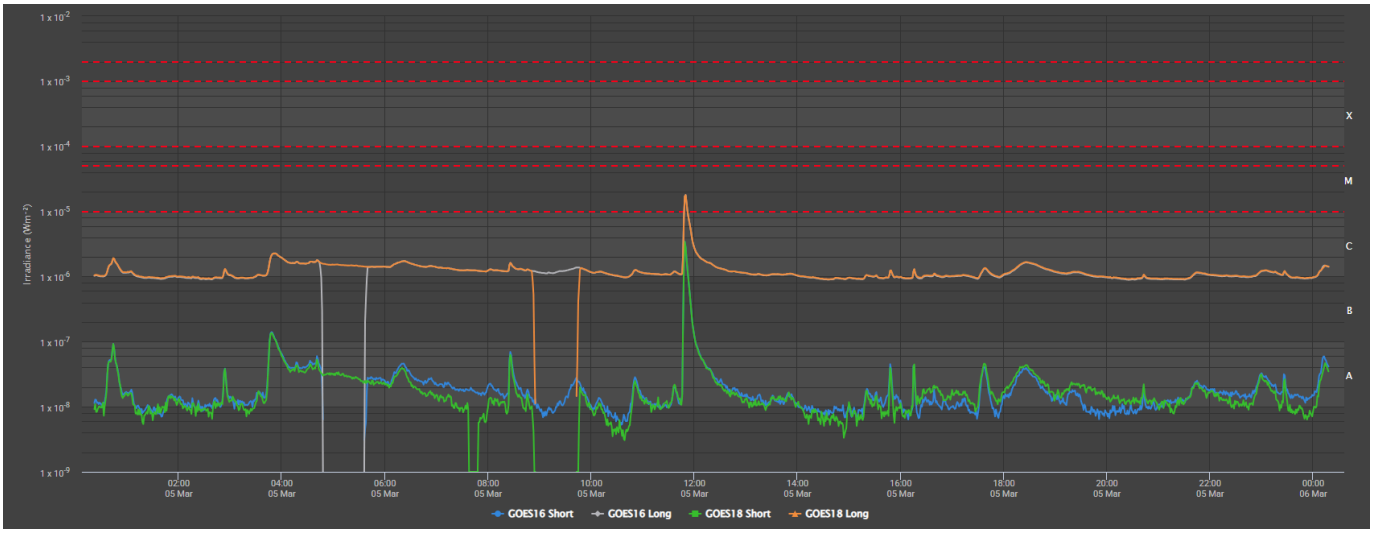
Radio Blackouts - X-Ray Flares

Nine sunspot regions cover the visible solar disc. AR4012 in the southeast is the largest region but hasn't produced any significant flares recently. AR4007, the second largest region , is a relatively simple bi-polar group. AR4009 lies just south of AR4014, both regions are declining and now unipolar. AR4011 faded to plage. AR4016 in the southeast has shown recent growth and has a complex magnetic structure despite its small size, it produced the only notable flare of the period an M1.7 at 05/1150UTC. AR4017 and 4018 have recently been numbered with AR4018 in the far southeast showing notable magnetic looping in SDO imagery of the limb.

Solar activity is forecast to be Moderate to Low, with M-class flares likely. The main risk from AR4012 in the southeast and an increasing risk from AR4016.

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	60	60	60	60
Very Active	R3-R5 (X Class)	No	5	5	5	5

Figure 3: GOES18 X-Ray flux



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Solar Radiation Storms (High Energy Protons)

GOES18 high energy (>10MeV) proton flux is at Background, and expected to remain at this level. There is a Slight Chance of enhancement to S1 given any significant eruption from the sunspot regions currently on the Earth-facing disc.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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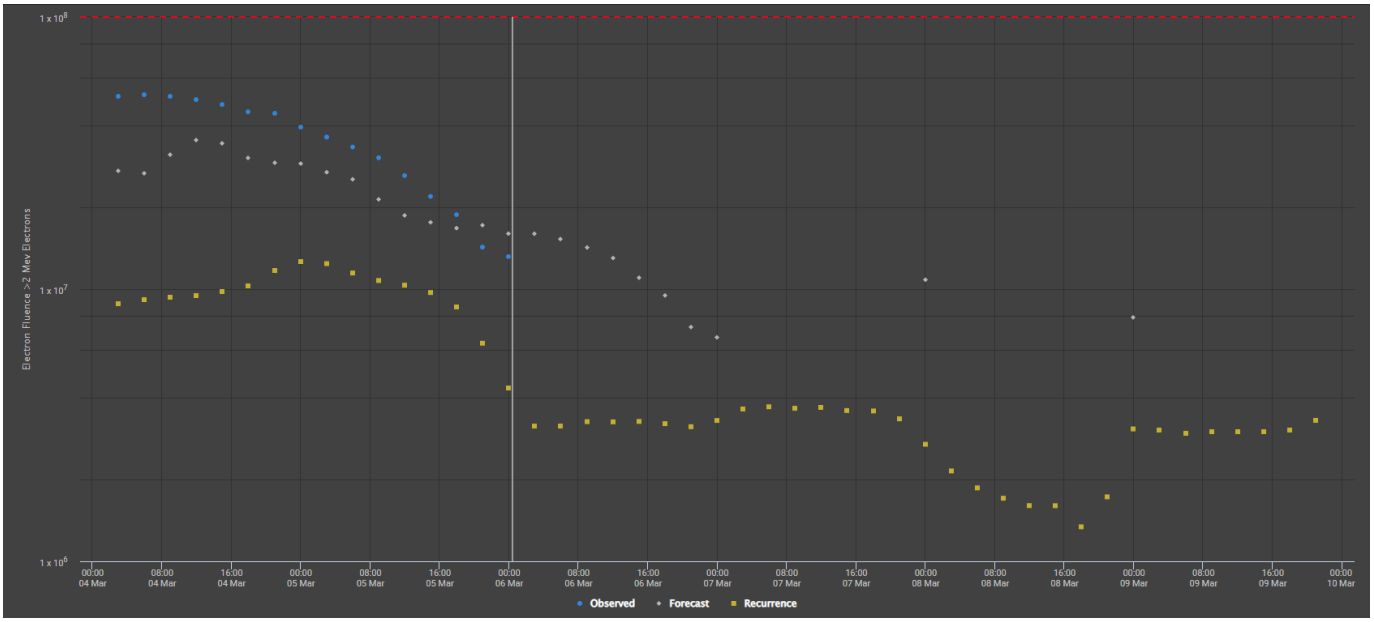
High Energy Electrons (≥ 2MeV)

The high-energy electron flux (>2MeV), as observed at GOES16, has been Normal Background to Moderate which is expected to continue. No further enhancements are forecast.

The associated 24-hour fluence is declining and is likely to remain below Active as indicated by MOSWOC REFM guidance output.

GEO Electron Environment	Level ($cm^{-2}sr^{-1}$ day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ 1×10^{8}	No	1	1	1	1
Very Active	≥ 2 MeV ≥ 1×10^{9}	No	1	1	1	1

Figure 4: MOSWOC REF Model



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